

Amendments to the Claims

Claim 1 (Currently amended): A process for producing ~~HFC-227ea~~ CF₃CFHCF₃ comprising ~~the steps of:~~

(a) contacting ~~a C-3 reactants~~ reactant selected for the group consisting of aliphatic, olefinic, or partially halogenated hydrocarbons having at least three carbon atoms, comprising one or more of perhydrogenated or partially halogenated C-3 hydrocarbons with Cl₂ and HF in the presence of a metal-containing first catalyst at a sufficient first temperature to form perhalogenated compounds a C-3 product comprising a C-3 perhalogenated compound;

(b) contacting the perhalogenated compounds C-3 product with HF in the presence of a metal-containing second catalyst at a sufficient second temperature to form ~~CFC-216aa~~ CF₃CCl₂CF₃;

(c) contacting the ~~CFC-216aa~~ CF₃CCl₂CF₃ with HF in the presence of a metal-containing third catalyst at a sufficient third temperature to form ~~CFC-217ba~~ CF₃CClFCF₃; and

(d) contacting the ~~CFC-217ba~~ CF₃CClFCF₃ with H₂ in the presence of a metal-containing fourth catalyst at a sufficient fourth temperature to produce ~~HFC-227ea~~ CF₃CFHCF₃.

Claim 2 (Original): The process of claim 1 wherein the first temperature is at least about 150°C, the second temperature is at least about 300°C, the third temperature is at least about 200°C and the fourth temperature is at least about 30°C.

Claim 3 (Original): The process of claim 2 wherein the first temperature is from about 150°C to about 450°C, the second temperature is from about 300°C to about 550°C, the third temperature is from about 200°C to about 550°C and the fourth temperature is from about 30°C to about 275°C.

Claim 4 (Currently amended): The process of claim 3 wherein the first temperature is at least about 220°C, the second temperature is at least about 470°C, the third temperature is at least about 470°C and the fourth temperature is at least about 185°C.

Claim 5 (Currently amended): The process of claim 1 wherein ~~the~~ during the contacting of the C-3 reactant with the HF and the Cl₂, a molar ratio of HF:Cl₂ used in step (a) the HF to the Cl₂ is from about 0.75:1 to about 8:1.

Claim 6 (Currently amended): The process of claim 5 wherein ~~the~~ during the contacting of the C-3 reactant with the HF and the Cl₂, a molar ratio of HF:Cl₂ used in step (a) the HF to the Cl₂ is at least about 4:1.

Claim 7 (Currently amended): The process of claim 1 wherein ~~the~~ during the contacting of the C-3 reactant with the HF and the Cl₂, a molar ratio of the Cl₂ to the C-3 reactants used in step (a) reactant is from about 8:1 to about 10:1.

Claim 8 (Currently amended): The process of claim 7 wherein ~~the~~ during the contacting of the C-3 reactant with the HF and the Cl₂, a molar ratio of the Cl₂ to the C-3 reactants used in step (a) reactant is at least about 8.2:1.

Claim 9 (Currently amended): The process of claim 1 wherein ~~the~~ during the
contacting of the C-3 reactant with the HF and the Cl₂, a molar ratio of the HF to the C-3
~~reactants used in step (a)~~ reactant is from about 6:1 to about 64:1.

Claim 10 (Currently amended): The process of claim 9 wherein ~~the~~ during the
contacting of the C-3 reactant with the HF and the Cl₂, a molar ratio of the HF to the C-3
~~reactants used in step (a)~~ reactant is at least about 35:1.

Claim 11 (Currently amended): The process of claim 1 wherein ~~the~~ during the
contacting of the C-3 product with the HF, a molar ratio of the HF to perhalogenated
~~compounds used in step (b)~~ the C-3 product is from about 6:1 to about 64:1.

Claim 12 (Currently amended): The process of claim 11 wherein ~~the~~ during the
contacting of the C-3 product with the HF, a molar ratio of the HF to perhalogenated
~~compounds in step (b)~~ the C-3 product is at least about 30:1.

Claim 13 (Currently amended): The process of claim 1 wherein ~~the~~ during the
contacting of the CF₃CCl₂CF₃ with the HF, a molar ratio of the HF to CFC-216aa used
~~in step (e)~~ the CF₃CCl₂CF₃ is from about 1:1 to about 30:1.

Claim 14 (Currently amended): The process of claim 13 wherein ~~the~~ during the
contacting of the CF₃CCl₂CF₃ with the HF, a molar ratio of the HF to CFC-216aa used
~~in step (e)~~ the CF₃CCl₂CF₃ is at least about 10:1.

Claim 15 (Currently amended): The process of claim 1 wherein ~~the~~ during the contacting of the $\text{CF}_3\text{CClFCF}_3$ with the H_2 , a molar ratio of the H_2 to CFC-217ba used in step (d) the $\text{CF}_3\text{CClFCF}_3$ is from about 0.2:1 to about 10:1.

Claim 16 (Currently amended): The process of claim 15 wherein ~~the~~ during the contacting of the $\text{CF}_3\text{CClFCF}_3$ with the H_2 , a molar ratio of the H_2 to CFC-217ba used in step (d) the $\text{CF}_3\text{CClFCF}_3$ is at least about 1.2:1.

Claim 17 (Currently amended): The process of claim 1 further comprising ~~the addition of water in step (d)~~ during the contacting of the $\text{CF}_3\text{CClFCF}_3$ with H_2 , contacting the fourth catalyst with water.

Claim 18 (Currently amended): The process of claim 17 wherein the water is present in an amount from about 0.04 to about 12 percent by weight of the C_3ClF_7 $\text{CF}_3\text{CClFCF}_3$.

Claim 19 (Currently amended): The process of claim 18 wherein the water amount is about 0.8 percent by weight of the CFC-217ba $\text{CF}_3\text{CClFCF}_3$.

Claim 20 (Currently amended): The process of claim 1 further comprising ~~the addition of Cl_2 in step (b)~~ during the contacting of the C-3 product with HF , contacting the C-3 product with Cl_2 .

Claim 21 (Currently amended): The process of claim 1 wherein the ~~metal-containing first catalyst of step (a)~~ comprises chromium and a catalyst support.

Claim 22 (Currently amended): The process of claim 1 wherein the ~~metal-containing~~
second catalyst of step (b) comprises chromium and a catalyst support.

Claim 23 (Currently amended): The process of claim 1 wherein the ~~metal-containing~~
third catalyst of step (c) comprises chromium and a catalyst support.

Claim 24 (Currently amended): The process of claim 1 wherein the ~~metal-containing~~
fourth catalyst of step (d) comprises Pd palladium and a catalyst support.

Claim 25 (Currently amended): The process of claim 1 further comprising ~~the addition~~
~~of diluent in at least one of steps (a)-(d)~~ , during the contacting of the C-3 reactant with
HF and Cl₂, contacting the C-3 reactant with a diluent.

Claim 26 (Currently amended): The process of claim 1 wherein, ~~in at least one of steps~~
~~(a)-(c), underfluorinated products are recycled to at least one of steps (a)-(c)~~ the C-3
product further comprises a halogenation by-product and, during the contacting of the
C-3 reactants with the Cl₂ and the HF, the C-3 reactants further comprises the
halogenation by-product.

Claims 27-38 (Cancelled).

Claim 39 (Currently amended): A process for producing ~~HFC-227ea~~ CF₃CFHCF₃ comprising the steps of:

(a) contacting a C-3 reactants selected for the group consisting of aliphatic, olefinic, or partially halogenated hydrocarbons having at least three carbon atoms, reactant comprising one or more of perhydrogenated and partially halogenated C-3 hydrocarbons with Cl₂ and HF in the presence of a ~~metal containing~~ first catalyst at a sufficient first temperature to form ~~perhalogenated compounds~~ a C-3 product comprising a C-3 perhalogenated compound; and

(b) contacting the ~~perhalogenated compounds~~ C-3 product with HF in the presence of a ~~metal containing~~ second catalyst at a sufficient second temperature to form ~~GFC-217ba~~ CF₃CCIFCF₃;

(c) contacting the ~~GFC-217ba~~ CF₃CCIFCF₃ with H₂ in the presence of a ~~metal containing~~ third catalyst at a sufficient third temperature to form ~~HFC-227ea~~ CF₃CFHCF₃.

Claim 40 (Original): The process of claim 39 wherein the first temperature is at least about 150°C, the second temperature is at least about 200°C, and the third temperature is at least about 30°C.

Claim 41 (Original): The process of claim 40 wherein the first temperature is from about 150°C to about 300°C, the second temperature is from about 200°C to about 550°C, and the third temperature is from about 30°C to about 275°C.

Claim 42 (Currently amended): The process of claim 41 wherein the first temperature is at least about 220°C, the second temperature is at least about 470°C, and the third temperature is at least about 185°C.

Claim 43 (Currently amended): The process of claim 39 wherein ~~the~~ during the contacting of the C-3 reactant with the Cl₂ and the HF, a molar ratio of HF:Cl₂ used in step (a) the HF to the Cl₂ is from about 0.75:1 to about 8:1.

Claim 44 (Currently amended): The process of claim 43 wherein ~~the~~ during the contacting of the C-3 reactant with the Cl₂ and the HF, a molar ratio of HF:Cl₂ used in step (a) the HF to the Cl₂ is at least about 4:1.

Claim 45 (Currently amended): The process of claim 39 wherein ~~the~~ during the contacting of the C-3 reactant with the Cl₂ and the HF, a molar ratio of the Cl₂ to the C-3 reactants used in step (a) reactant is from about 8:1 to about 10:1.

Claim 46 (Currently amended): The process of claim 45 wherein ~~the~~ during the contacting of the C-3 reactant with the Cl₂ and the HF, a molar ratio of the Cl₂ to the C-3 reactants used in step (a) reactant is at least about 8.2:1.

Claim 47 (Currently amended): The process of claim 39 wherein ~~the~~ during the contacting of the C-3 reactant with the Cl₂ and the HF, a molar ratio of the HF to the C-3 reactants used in step (a) reactant is from about 6:1 to about 64:1.

Claim 48 (Currently amended): The process of claim 47 wherein ~~the~~ during the contacting of the C-3 reactant with the Cl_2 and the HF, a molar ratio of the HF to the C-3 reactants used in step (a) reactant is at least about 35:1.

Claim 49 (Currently amended): The process of claim 39 wherein ~~the~~ during the contacting of the C-3 product with the HF, a molar ratio of the HF to perhalogenated compounds used in step (b) the C-3 product is from about 6:1 to about 64:1.

Claim 50 (Currently amended): The process of claim 49 wherein ~~the~~ during the contacting of the C-3 product with the HF, a molar ratio of the HF to perhalogenated compounds in step (b) the C-3 product is at least about 30:1.

Claim 51 (Currently amended): The process of claim 39 wherein ~~the~~ during the contacting of the $\text{CF}_3\text{CClFCF}_3$ with the H_2 , a molar ratio of ~~HF~~ the H_2 to the CFC-217ba $\text{CF}_3\text{CClFCF}_3$ used in step (c) is from about 0.2:1 to about 10:1.

Claim 52 (Currently amended): The process of claim 51 wherein ~~the~~ during the contacting of the $\text{CF}_3\text{CClFCF}_3$ with the H_2 , a molar ratio of the H_2 to the CFC-217ba $\text{CF}_3\text{CClFCF}_3$ used in step (c) is at least about 1.2:1.

Claim 53 (Currently amended): The process of claim 39 further comprising ~~the addition of water in step (c)~~, during the contacting of the $\text{CF}_3\text{CClFCF}_3$ with the H_2 , contacting the third catalyst with water.

Claim 54 (Currently amended): The process of claim 53 wherein the water is present in an amount from about 0.04 to about 12 percent by weight of the ~~CFC-217ba~~ CF₃CClFClF₃.

Claim 55 (Currently amended): The process of claim 54 wherein the ~~water amount~~ is about 0.8 percent by weight of the ~~CFC-217ba~~ CF₃CClFClF₃.

Claim 56 (Currently amended): The process of claim 39 further comprising ~~the addition of Cl₂ in step (b),~~ during the contacting of the C-3 product with HF, contacting the C-3 product with Cl₂.

Claim 57 (Currently amended): The process of claim 39 wherein the ~~metal-containing first catalyst of step (a)~~ comprises chromium and a catalyst support.

Claim 58 (Currently amended): The process of claim 39 wherein the ~~metal-containing second catalyst of step (b)~~ comprises chromium and a catalyst support.

Claim 59 (Currently amended): The process of claim 39 wherein the ~~metal-containing third catalyst of step (c)~~ comprises ~~Pd~~ palladium and a catalyst support.

Claim 60 (Currently amended): The process of claim 39 further comprising ~~the addition of diluent in at least one of steps (a)-(b),~~ during the contacting of the C-3 reactant with Cl₂ and HF, contacting the C-3 reactant with a diluent.

Claim 61 (Currently amended): The process of claim 39 wherein, ~~in at least one of steps (a)-(b), underfluorinated products are recycled to at least one of steps (a)-(b)~~ the C-3 product further comprises a halogenation by-product and, during the contacting of the C-3 reactant with the Cl_2 and the HF, the C-3 reactant further comprises the halogenation by-product.

Claims 62-88 (Cancelled).

Claim 89 (New): The process of claim 1 further comprising, during the contacting of the C-3 product with the HF, contacting the C-3 product with a diluent.

Claim 90 (New): The process of claim 1 further comprising, during the contacting of the $\text{CF}_3\text{CCl}_2\text{CF}_3$ with the HF, contacting the $\text{CF}_3\text{CCl}_2\text{CF}_3$ with a diluent.

Claim 91 (New): The process of claim 1 further comprising, during the contacting of the $\text{CF}_3\text{CClCF}_3$ with the H_2 , contacting the $\text{CF}_3\text{CClCF}_3$ with a diluent.

Claim 92 (New): The process of claim 1 wherein the contacting of the $\text{CF}_3\text{CCl}_2\text{CF}_3$ with the HF also forms a halogenation exchange by-product and, during the contacting of the C-3 product with HF, the C-3 product further comprises the halogenation exchange by-product.

Claim 93 (New): The process of claim 92 wherein the halogenation exchange by-product comprises one or more of $\text{CF}_3\text{CCl}_2\text{CF}_3$, $\text{CF}_3\text{CF}_2\text{CF}_3$, and $\text{C}_3\text{F}_5\text{Cl}_3$.

Claim 94 (New): The process of claim 1 wherein the contacting of the $\text{CF}_3\text{CCl}_2\text{CF}_3$ with the HF also forms halogenation exchange by-product and, during the contacting of the C-3 reactant with Cl_2 and HF, the C-3 reactant further comprises the halogenation exchange by-product.

Claim 95 (New): The process of claim 94 wherein the halogenation exchange by-product comprises one or more of $\text{CF}_3\text{CCl}_2\text{CF}_3$, $\text{CF}_3\text{CF}_2\text{CF}_3$, and $\text{C}_3\text{F}_5\text{Cl}_3$.

Claim 96 (New): The process of claim 1 wherein the first and the second catalysts comprise the same material.

Claim 97 (New): The process of claim 1 wherein the first and the second catalyst comprise the same material as the third catalyst.

Claim 98 (New): The process of claim 39 further comprising, during the contacting of the C-3 product with the HF, contacting the C-3 product with a diluent.

Claim 99 (New): The process of claim 39 further comprising, during the contacting of the $\text{CF}_3\text{CClFCF}_3$ with the H_2 , contacting the $\text{CF}_3\text{CClFCF}_3$ with a diluent.

Claim 100 (New): The process of claim 39 wherein the contacting of the C-3 product with the HF also forms a halogenation exchange by-product and, during the contacting of the C-3 reactant with Cl_2 and HF, the C-3 reactant further comprises the halogenation exchange by-product.

101 (New): The process of claim 100 wherein the halogenation exchange by-product comprises one or more of $\text{CF}_3\text{CCl}_2\text{CF}_3$, $\text{CF}_3\text{CF}_2\text{CF}_3$, and $\text{C}_3\text{F}_5\text{Cl}_3$.

Claim 102 (New): The process of claim 39 wherein the first and the second catalysts comprise the same material.

Claim 103 (New): The process of claim 39 wherein the first and the second catalyst comprise the same material as the third catalyst.